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Studies by the Research Center for Fisheries Science

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Three species and one sub-species of lampreys, *Entosphenus tridentatus* (*RICHARDSON*), *Lampetra japonica japonica* (*MARTENS*), *Lampetra japonica kessleri* (*ANIKIN*) and *Lampetra reissneri* (*DYBOWSKY*) have been observed by the author from the ecological and taxonomical points of view in the fresh waters of Hokkaido.

Among these species *E. tridentatus* and *L. j. japonica* have been rather rarely collected in Hokkaido. The ecological studies have been made mainly on *L. j. japonica* and *L. reissneri* in the following stages; ammocoetes, recently transformed young, young of the time of descent to the sea, adult of the time of re-ascending the river and of the breeding season.

In Ishikari River, two seasonal races of *L. j. japonica* have been recognized. The summer race ascends the stream in late spring and early summer and spawns in summer, while the winter race ascends in autumn and early winter and spawns in early spring of the next year. Hitherto the breeding specimens of the latter have been reported as *Lampetra mitsukurii HATTA* by japanese authors.

The so far recorded types of lamprey belonging to the Petromyzontidae family in Hokkaido are the following 2 genera 3 species viz.

1. Entosphenus tridentatus (RICHARDSON)
2. Lampetra jamponica japonica (MARTENS)
3. Lampetra reissneri (DYBOWSKI)

There are also the L. japonica kessleri (ANIKIN) from Sakhalin bordering on Hokkaido and Lampra sp. said to be similar to L. morii found in the Tsuimu* river basin according to a report by Taranetz

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*Translator' note: transliteration of Japanese phonetic rendering of uncertain foreign name; same hereafter

(1937). Yet among the three above species, L. japonica japonica and L. reissneri only are commonly called "lamprey" in Hokkaido. Only one E. tridentatus and two Sakhalin L. japonica kessleri have been collected.

We have already noted the existence of L. japonica kessleri in Hokkaido (presentation a the Japanese Zoological Society) but there is no report of body structure observations. So, relying on the descriptions of E. tridentatus made by Suguru OKADA (unpublished), we will describe the body structure of L. japonica kessleri, using samples from the Shibechari river and will report briefly some ecological observations of L. japonica japonica and L. reissneri. We will also discuss the bases for future ecological research as well as the reason for the confusion in the names presently used in Japan.

I thank Suguru OKADA, Junsuke SOEDA and Kiichiro YAMAMOTO who helped me gather the materials necessary for this study. Part of this study was financially supported by the Ministry for Education.

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1. Entosphenus tridentatus (RICHARDSON)

(Mitsuba yatsume, yufutsu yatsume)

Only 1 specimen of this species was collected in Japan. It was found by Suguru OKADA in the Utonaito marsh located in the basin of the Yufutsu river in Hokkaido (November 20, 1934). The specimen was identified as Entosphenus tridentatus (GAIRDNER) by Shigeho TANAKA (Okada, unpublished) and called later Lampetra tridentata GAIRDNER), yufutsu yatsume (Tanaka, 36). As this species is only rarely caught in the Utonaito swamps, we have seen no specimen yet. Through the kind help of OKADA, I give briefly the desription made by the same researcher.

Body structure (Table 1)

Total length: 600 mm for females; the supra-oral lamina of the mouth has 3 cusps. The one in the middle is about half the size of the two terminal ones and each has a pointed extremity. The infra-oral lamina has 7 cusps all of them being of a roughly equal size. There are 4 inner labial teeth on both sides. On both sides, the 2 center teeth have 3 cusps (1+1+1) and the 2 others 2 cusps (1+1). All are sharp. The lower labial teeth consist of about 20 small teeth. Of these, 16 are disposed in parallel with the rim. At both ends, two each and altogether four make up two rows and are connected with the inner labial teeth. The upper labial teeth have only one cusp. The five teeth in the lower part exhibit also a wide hook-shape.

The external appearance is practically the same as for (kawa yatsume) L. japonica japonica. The color of the body is blue-grey with the abdominal surface of almost the same color. The first and second dorsal fins are separate. p. 56

Distribution

These lampreys are widely distributed along the American Pacific coast from Alaska to California and in the Bering sea. In Japan, they have been seen in the above Yufutsu river in Hokkaido.

Discussion about species name and distribution

In Japan, Tanaka (1936) and Okada, Ikeda (1938) used the species name Lampetra tridentata (GAIRDNER). Okada and Matsubara (1938) use the name L. tridentata (RICHARDSON) for the above specimens. Schultz (1936) used the name Entosphenus tridentata (GAIRDNER) for the American species

but we follow Berg (1931), Holly (1932) and will call it Entosphenus tridentatus (RICHARDSON). Furthermore, Creaser and Hubbs (1922) noted 2 subspecies distributed widely to the South and North with the Columbia river as center, and reported that E. tridentatus tridentatus RICHARDSON is observed in the north while E. tridentatus ciliatus AYRES is found in the south. At this time the relationship between the Hokkaido species and these subspecies is unknown. As for the distribution, Okada and Ikeda (1938) reported also a presence along the Okhotsk coast of Hokkaido but the situation in this region is presently unknown.

2. Lampetra japonica japonica (MARTENS) (Kawa yatsume)

This species is together with L. reissneri a rather commonly seen large lamprey. The usual length is 400-500 mm. In the spring and in the fall they leave the sea, enter and swim up the rivers to spawn. The spawning season seems generally to last from late April to late August. The metamorphosis from ammocoete to the young stage takes place from the fall to the winter. In the spring, that is, in May-June, they swim down the rivers and enter the sea. The individuals described here are the ammocoetes, young stage individuals having barely completed their metamorphosis, young stage individuals swimming down the rivers, adults swimming up the rivers and spawning adults (Table 1) which we were able to collect.

Ammocoetes:

A description will be omitted here, as there are detailed descriptions made by Suguru OKADA (1937)

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Young fish having barely completed the metamorphosis:

We observed 7 individuals with a body length of 154-192 mm (Dec. 1936 Tobetsu river, October 15 1938 vicinity of Sapporo, October 1939 Taranpaku**(Sakhalin)). We noted the following.

The rows of teeth in the mouth are as follows. The supra-oral lamina has 2 cusps (1+1) and the infra-oral lamina has 6-7. Each tooth on both sides, excepting two are simple and they do not form two rows (1+4 ~ 5+1). There are 13-19 upper labial teeth and 18-23 lower labial teeth in one row. Generally, the development of the individual teeth is poor. More particularly on the infra-oral lamina, they are covered by a film or muscular texture and the tips can hardly be seen. The overall development of the oral disc is incomplete. The number of myotomes from the end of the gill slits to the projection of the anal fin is 70-74. Compared to L. reissneri having just undergone metamorphosis, the eyes are large and twice as big with a diameter of 4-5 mm. The color of the body is blue-black. The overall blue color is strong. On the dorsal and caudal fins, black spots were already appearing.

Young catadromous spring fish

The 8 145-198 mm long individuals (Chitose May 1936, Banaguro, May 1937, Akkeshi May 1939) are as follows.

All teeth in the mouth are well developed and sharp. The supra-oral lamina has 2 cusps (1+1) and the infra-oral lamina 6-5 cusps

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**Translator's note: probable but not quite certain reading; same hereafter

($1^{(2)}$+ 3 - 4 + $1^{(2)}$). The various teeth on both sides constitute 2 rows. On both sides there are 3 lateral teeth. Each has 2 cusps (1+1). There are 14-27 upper labial teeth and one row of 18-22 lower labial teeth. From the end of the gill slits to the projection of the anal fin, there are 68-74 myotomes. p. 57

At this stage, the body is almost similar to that of individuals having just completed the metamorphosis. Yet in the head, the development of the oral disk lengthens somewhat the snout but the diameter of the eyes is still 4-5 mm. The body color is still the blue-tinged black seen in individuals just completing the metamorphosis. The diameter of the eyes is larger than in L. reissneri and there is a conspicuous black portion on the caudal fin and on the 2nd dorsal fin.

Anadromous adults

At this stage, the individuals are usually described as L. japonica. The 396-510 mm long 28 individuals which we collected (October 1936, Tobetsu; September 1940, FuKagawa; October 1937, Ebetsu) are described as follows. As all of them were caught while ascending the rivers, their gonads were not yet fully mature.

In the mouth, the tooth rows are well developed. The supra-oral lamina has 2 cusps (1+1) and the infra-oral lamina has 6-7 cusps ($1^{(2)}$ + 4 - 5 + $1^{(2)}$). Often the two on both sides are large and the tips forming 2 rows. There are 3 lateral teeth on both sides and each tooth has 2 cusps (1+1). There are 13-25 upper labial teeth and a row of 18-24 lower labial teeth. There are 62-73 surrounding teeth. All the teeth are well developed and sharp.

The body is blue-black. Sometimes the abdomen is of a slightly lighter color. Sometimes there are white cloud spots. The first and 2nd dorsal fins are separated. The shape of the second dorsal fin is somewhat different in males and females. The females have a sharp tip on a slightly triangular fin. Generally, no secondary sexual characters are noted although such characteristics may be seen in somewhat mature individuals swimming up the rivers in spring. Generally, the gonads are developed but not completely mature. A black portion is seen at the 2nd dorsal fin and caudal fin. There are 68-74 myotomes between the end of the gill slits and the projection of the anal fin.

Spawning adults

At this time, the secondary sexual characters are obvious. Because of the projection of the second dorsal fin, the first and second dorsal fins come in contact and the shape is that of the so-called mikkuri yatsume.

The nine 369-450 mm long individuals we collected (June 1937, Shubuto river; June 1937, Tororo river; May 1938, Ebetsu river) were as follows.

The structure of the tooth rows of the mouth is exactly the same as for the above individuals of the anadromous period. However the tips of the various teeth are sharper and there is a retrogressive shape. The supra-oral lamina has 2 cusps (1+1) and the infra-oral lamina has six ($1^2 + 4 + 1^2$). The two teeth on both sides are large and make 2 rows. On each side there are 3 lateral teeth and each tooth has 2 cusps (1+1). There are 15-19 upper labial teeth and 19-22 lower labial teeth in 1 row.

The color is grey-brown and the blue-black spots noted during the anadromous period have disappeared. Generally the body length is small. Retrogression is particularly obvious in the rear part at the back of the anus. The body is higher than in the anadromous period and the width decreases which means that the individuals are not roundish like during the anadromous period.

Of course, the precise period in which the anadromous-period individuals mature and exhibit the secondary sexual characters depends on the individuals and cannot be determined. When rearing in laboratory inside tanks having a temperature of 11.5°C - 13.5°C, May anadromous individuals of spring needed about 30 days.

Sept-Oct anadromous fall individuals kept at the same temperature matured in the early spring, that is March, April and needed 180 days, reaching into the following year. We intend to report these facts in detail on another occasion. In any case, the lampreys called mikkuri yatsume L. mitsukurii are certainly L. japonica japonica at the time of clear secondary sexual characters. The above shows that the differences with L. reissneri are as follows: 1) the premetamorphosis ammocoetes are markedly smaller than the adults, 2) the teeth in the mouth are well developed and there are always lower labial teeth, 3) the myotomes are numerous, being 68-77, 4) there is a black area on the second dorsal and on the caudal fins.

Discussion about species name and ecology

Martens (1868) distingues within this species the east asian kawayatsume and the European lamprey and used the name Petromyzon japonica. This lamprey was later found everywhere in Japan by

researchers such as Ishikawa (1897), Yata (1901, 1911, 1915), Jordan and Snyder (1901), Jordan, Tanaka and Snyder (1913), Regan (1911), Oyama (1922), Creaser (1922), Berg (1931) (1932), Jordan and Hubbs (1925) and there have been discussions. The name presently used in Japan is L. fluviatilis japonica according to Tanaka (1936). It is L. japonica with Okada, Matsubara (1937), Mori (1936), Okada, Ikeda (1938) and Miyaji (1940). For S. Okada (1937), Oshima (1940) it is L. fluviatilis. The differences are due to the question as to whether the European and East Asian kawayatsume belong to the same species. Berg (1931) collected both specimens and confirmed the distinction of species, on the basis of differences in tooth rows.

The second confusion originated from mixed ecological periods and groups (or phyla). For instance Jordan and Snyder (1901) classify the 300-500 mm long suna yatsume from the Ishikari river as L. mitsukurii and Yata (1911) uses the name "L. mitsukurii major". Likewise the large L. planeri and Mikkuri yatsume L. mitsukurii HATTA which according to Koyama (1922) are independent species are thought by Creaser and Hubbs (1922) as well as by Berg (1931) to be L. japonica japonica at the spawning period.

The point to watch here is that according to the descriptions made by Yata (1911), the spawning period of L. mitsukurii major is earlier than that of L. japonica and he says that in the vicinity of Sapporo spawning takes place at the end of April, that is at almost the same time as for suna yatsume. This is however based on rearing observations made about individuals from the Chitose river by Suguru OKADA (1937) who reports that the anadromous individuals of the fall period show a pattern of spawning in the following year and produce a mikkuri yatsume type. We do not consider the differences in

spawning season between L. japonica and L. mitsukurii major as being differences in species but think rather that the reason for the distinction lies in differences between seasonal anadromous groups (or phyla) of L. japonica japonica. We reared in laboratory individuals of the May-June anadromous group of the spring, and specimens of the September-October anadromous group of the fall collected in the Ishikari river in normal years so as to have materials for embryological research. The former group matured completely in June-July but the latter group did not mature fully and was seen to exhibit a complete spawning condition from late March to late April of the following year. This is why Yata's view (1911) that L. mitsukurii major consists of specimens of the spawning type from the fall anadromous group having reached the following year is correct. The seasonal difference amoung such anadromous groups had been noted by Berg also with regard to L. fluviatilis in the Newa river and he distinguished a winter race swimming up the rivers in the fall and spawning in May-June of the following year, and a summer race having mature gonads in the spring.

Of the 2 L. fluviatilis major and minor types proposed by Kudo, Asada (1936), it is certain that the latter is the pre-spawning immature type of L. reissneri as thought by Suguru OKADA (1937) and they call L. planeri major the "kawa yatsume" at the spawning period.

Although this species is known to be distributed throughout Sakhalin, it was only recorded relatively recently. That is, it is now clear that the species classified by Berg (1911) as L. japonica is the L. japonica kessleri presented hereafter. The specimens we collected thereafter (1942) at Taranpaku** on Sakhalin are the first specimens recorded for Sakhalin.

3. Lampetra japonica kessleri (ANIKIN) Shiberia Yatsume

This species is very similar to Kawa Yatsume L. japonica japonica but smaller. After Berg (1911) (1931) examined 2 individuals taken by Poliakov (1887) in Sakhalin, none were of course collected in Sakhalin or Hokkaido. We had the occasion of examining specimens taken from the Shibechari river of Hokkaido. The body structure is as follows. (Table 1, Fig. 1).

Body structure

All 26 individuals collected in the Shibechari river were at the spawning period. The secondary sexual characters were noticeable in both females and males. Some females had still their eggs while some others had spawned. They were 144-193 mm long. Eleven specimens were collected May 3, 1937 and 15 on June 8 of the same year. p. 59

The teeth rows of the mouth are completely similar to those of L. japonica japonica. The supra-oral lamina has 2 cusps and the infra-oral lamina has 7 ($1^{(2)} + 3 - 5 + 1^{(2)}$). Two on both sides are large and constitute often two rows. There are 3 lateral labial teeth on both sides and the various teeth have usually 2 cusps. Rarely there is 1 cusp on 1 side or on both sides of the 3rd pair. The upper labial teeth make a row and are similar to those of L. japonica japonica. For the lower labial teeth, there is a row of 17-23 teeth.

The external appearance is first very similar by the size to that of L. reissneri. Yet as they have the spawning-period form, they are rather more like L. japonica japonica. The body is high, somewhat

flat on the sides. The first and second dorsal fin touch one another and the anal fin is developed. The males exhibit an anal process.

The color of the body is somewhat bluish black with the abdomen of a lighter whitish color. The caudal fin has a black-colored part as seen in L. japonica japonica. This is not seen in the 2nd dorsal fin. We counted 66-74 myatomes between the end of the gill slits and the anal fin projection. Therefore, the distinction from L. japonica japonica is as follows. 1) the adults are smaller, 2) the tooth rows are almost the same although we see some retrograding trend, 3) the tooth rows are also well developed during the spawning period, 4) a black color part can be seen only in the caudal fin.

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Distribution

The rivers extending from the Obi* river in Siberia to the Korima*, Andeiru* rivers, Sakhalin, the Shibechari river in Hokkaido.

Discussion of species name and ecology

The name was first mistakenly given by Berg (1911) as L. japonica japonica. The species was seen as being the same as L. fluviatilis japonica or L. reissneri. It has also been called L. planeri reissneri. In Sakhalin it was reported by the former name.

Berg (1931) thought that this species was not descending toward the sea. This point is still uncertain with regard to the material from Hokkaido. Usually the ammocoetes are 200 mm long or less although some are said to reach up to 220-260 mm. The ammocoetes we saw in the Shibechari river reached 258 mm. Some had a size unseen among the ordinary ammocoetes of L. japonica japonica. Yet by the external

appearance or number of myotomes, the two species cannot be distinguished. Follow-up observations about ammocoetes are necessary.

4. Lampetra reissneri (DYBOWSKI) (Suna Yatsume)

This species is seen everywhere in Hokkaido together with L. japonica japonica. It is a smaller species. It spawns for a short period in the spring (from late April to late May) in small streams. Metamorphosis form the ammocoete state takes place according to Suguru OKADA (1937) during the fall or the winter. This species is said not to swim down the rivers and to spawn in the next spring.

The state of the adults immediately after metamorphosis was till relatively recently unknown. As only individuals with clear secondary sexual characters at the spawning period were described, this species tended in Japan to be confused with L. japonica japonica whose secondary sexual characters are clear. Because of the report by Suguru OKADA (1937), the difference between the two species became clear.

We will describe specimens having just completed the metamorphosis and other specimens having clear secondary sexual characters.

Individuals having completed their metamorphosis

We observed 5 individuals with a length of 133-174 mm (Chitose, November 1936; vicinity of Sapporo, October 15, 1938). The size is about the same as for the spawning period. The tooth rows of the mouth are not yet completely developed. The supra-oral lamina has 2 cusps

(1+1) and the tips are sharp. The infra-oral lamina has 5-7 cusps (1+3 - 5+1) and the two at both ends are somewhat larger. They are entirely covered by a skin membrane. There are 3 lateral labial teeth on both sides, each tooth having 2(1+1) cusps or just one. In such case the central ones have always 2 cusps. In one 156 mm long individual, the lateral teeth were not yet visible. The lower labial teeth are poorly developed, their number unknown and the upper labial teeth also are not yet completely developed. We saw 12-16 teeth. There are 57-66 myatomes from the end of the gill slits to the projection of the anal fin. The external appearance is the same in females and males so that there are no secondary sexual characters at all. Both dorsal fins are clearly separated and we saw no difference in fin shape between females and males.

Spawning period ecology

In the spawning period, the secondary sexual characters appear clearly. Because of the process of the secondary dorsal fin, the first and second dorsal fins come in contact. The dorsal rim of the dorsal fin of the male becomes roundish and the anal process appears. In the female, the dorsal rim of the dorsal fin shows a somewhat triangular shape and the caudal fin appears clearly.

Individuals having such shape are commonly seen in spring in Hokkaido during the spawning period of April-May. The strucutre of 9 individuals with a length of 120-142 mm (Sapporo, May 4, 1928) is as follows.

Regarding the teeth rows in the mouth, the supra-oral lamina has 2 cusps (1+1) and the infra-oral lamina 6 or 7 (1+4 - 5+1). The two on

both sides are large but not in 2 rows. There are 3 labial teeth on both sides, each one having 2(1+1) or 1 cusp. The one at the center has commonly 2 cusps. There are 12-17 upper labial teeth and a row of 17-19 lower labial teeth. None were seen at all in 126 mm long individuals. The same was seen in 10 individuals (125-162 mm length) gathered at Nakanoshima in the vicinity of Sapporo (May 1938). In 2 of these the tooth rows were poorly developed and it was impossible to determine the number of teeth. In one individual, nothing was seen at all. There were 58-64 myotomes from the end of the gill slits to the projection of the anal fin.

Distribution

Sea of Japan from Vladivostok to Anadeiru*, sea of Okhotsk and Pacific coast, Sakhalin from the estuary of the Amur river to Transbaicalia, Hokkaido, Kuriles, Honshu

Discussion on the Species name

This species was first called Lampetra mitsukurii on the basis of observations made by Yata (1901), Jordan - Snyder (1901) and Tanaka (1908) on specimens from Hokkaido and Sakhalin. Later, Yata (1911), used the name "L. mitsukurii minor". Regan (1911), Jordan, Tanaka and Snyder (1913) considered this species to be the same as L. planeri in Europe, and Yata (1915) agreed. Yet in such case L. mitsukurii major (= L. japonica japonica) is also included. This is why Koyama (1922) p. 61 distinguished the latter, established it as a separate species and called it L. Mitsukurii HATTA, calling the other L. planeri. Creaser and Hubbs (1922) distinguished the L. mitsukurii minor of Yata from Entosphenus appendix (= L. wildneri) and thought that there was also a

L. planeri. Later however Jordan and Hubbs (1925) considered both as being a type of Entosphenus mitsukurii. Bron's (1924) considers also L. kessleri from the Obi river previously referred to by Berg (1906) as well as L. reissneri of the Amur region as synonyms of L. Planeri. However Berg (1931) (1932) sees the Japan-produced specimens as L. reissneri, and separate from L. planeri. Later Holly (1932), Pietschmann (1935), Mori (1936), Miyaji (1940) etc. used this species name but Tanaka (1936), Okada, Matsubara (1937), Suguru Okada (1937), Oshima kept using the name L. planeri.

Kudo and Asada (1936) distinguished 2 types among the lampreys from Echigo viz. L. planeri minor and L. planeri major. One may of course think that the latter is L. mitsukurri major (= L. mitsukurii HATTA) or L. japonica japonica including the ovipositing type of the spring anadromous groups. It is correct to assume that L. planeri minor is the oviposition period type of L. reissneri and that calling the immature adults not having entered the spawning period L. fluviatilis minor was done first by Suguru OKADA (1937). It seems however that Suguru OKADA (1937) wondered in the same writings whether there was not some relationship between L. fluviatilis and L. fluviatilis forma pareox from Russia. However this is only a similarity in names and one must consider both L. planeri minor from Echigo and L. fluviatilis minor as being L. reissneri.

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Summary

1. The lampreys living in Hokkaido are the 2 genera, 3 species, 2 subspecies Entosphenus tridentatus, Lampetra japonica japonica, Lampetra japonica kessleri and Lampetra reissneri.

2. To study L. japonica kessleri, we used 26 specimens collected from the Shibechari river on the Pacific coast.

3. We studied the particular ecological periods of L. japonica japonica and of L. reissneri. Regarding the former we examined ammocoetes, specimens having just gone through metamorphosis, specimens swimming down the rivers and others at the anadromous period, as well as spawning period individuals. As for the latter, we examined individuals having just undergone metamorphosis as well as others at the spawning period.

4. It seems that the confusion in Japan regarding the names of L. japonica japonica and L. reissneri comes from not distinguishing the changes in body form caused by the ecological periods and of not recognizing the seasonal races.

Table I. Measurement of lampreys of Hokkaido.

Species	*E. tridentatus*	*L. j. japonica*				*L. j. kessleri*	*L. reissneri*	
Stage of specimens *	Adult (I)	Young (I)	Young (II)	Adult (I)	Adult (II)	Adult (II)	Young (I)	Adult (II)
Month of collection	XI	X, XII	V	VI, IX, X	V, VI	V, VI	X, XI	V
Number of specimens	1	7	8	28	9	26	5	9
Total length(mm)	600	151~192	145~198	396~510	369~450	144~193	133~174	118~142
Diameter of eye(mm)		4~5	4~5	5~5,6	6~8	3~3,5	2~3	2
Diameter of oral disc (mm)		7~9	8~10	19~23	16~22	7,5~9,5	5~7	6~7
Number of myotom		70~74	68~74	68~74	70~77	66~74	57~66	58~64
Supraoral lamina	1+1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1
Infraoral lamina	1+5+1	1+4~5+1	1+3~4+1 (2)	1+4~5+1 (3)	1+4+1 (2)	1+3~5+1 (3) (2)	1+3~5+1	1+4~5+1
Lateral lab. teeth I st	1+1	1+1	1+1	1+1	1+1	1+1	1+1 (1)	1+1 (1)
II nd.	1+1+1	1+1	1+1	1+1	1+1	1+1	1+1	1+1
III rd.	1+1+1	1+1	1+1	1+1	1+1	1+1 (1)	1+1 (1)	1+1 (1)
IV th	1+1	0	0	0	0	0	0	0
Upper labial teeth	8	13~19	14~27	13~25	15~19	12~21	12~16	12~17
Lower labial teeth	20	18~23	18~22	18~24	19~22	17~23	0	17~19 (0)

* In stage of specimens, Young (I); recently transformed young. Young (II); young of the time of descend to the sea. Adult (I); adult of the time of re-ascending the river. Adult (II); breeding specimen.

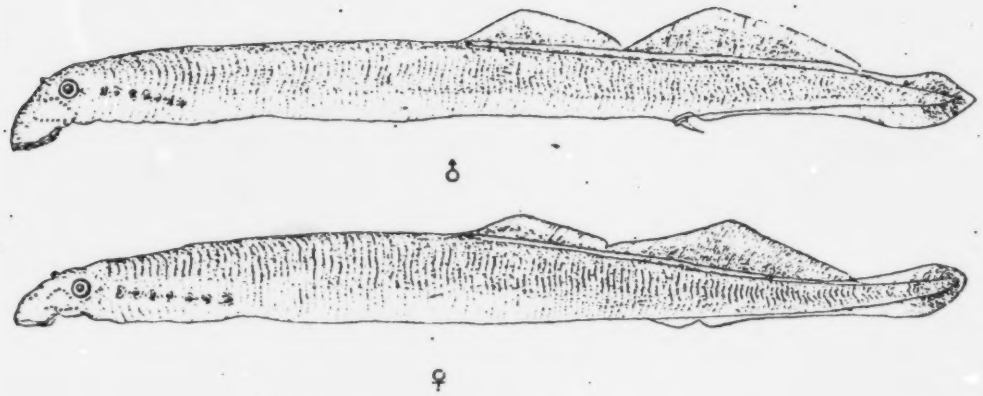

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Fig. 1. *Lampetra japonica kessleri* (*ANIKIN*)
♂,155mm, ♀,152mm, Shibecchari River.

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*Translator's note: or "Homa" ?..; probable reading only